Marine Jet-Propulsion Technology

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MSFC is NASA's leader for the development and management of the space shuttle's propulsion elements, has developed the Saturn series of rockets that took man to the Moon, and is managing the development of propulsion systems for the next generation of space vehicles being developed by NASA. Arkansas-based North American Marine Jet, Inc., has tapped into this vast reservoir of experience in hopes of repositioning the company's global marketplace. At present, the ship jet-propulsion engine market is dominated by manufacturers in Europe and New Zealand. However, NASA technology may help U.S. firms compete more successfully, and marine jet-propulsion technology may also find its way into U.S. Navy propulsion systems later this year.

When company president Leonard Hill and his design staff from North American Marine Jet first met with Robert Garcia of the Computational Fluid Dynamics Branch of MSFC's Structures and Dynamics Laboratory, Garcia used the branch's analytical systems to reveal that the Arkansas firm's proposed design for an improved impeller would not meet desired performance requirements. Garcia, Hill, and the firm's design team then discussed possible design modifications, which Garcia then analyzed. His calculations correctly predicted a new design would meet or exceed all requirements, resulting in an overall improved design and the creation of a new product line for the firm.

Garcia's three-dimensional computer model of the impeller design enabled Paul Gill of MSFC's Materials and Processes Laboratory and NASA contractor engineers at Rocketdyne to use rapid-prototyping systems to make a solid polycarbonate model, allowing the engineers to optimize the improved impeller's production process. Ordinarily, the firm would have had to produce a wooden "master" of the impeller blade, make an epoxy mold and then wax impeller blades from the epoxy mold, machine an impeller hub, precisely attach four

FIGURE 120.—A new MSFC-designed impeller.

FIGURE 121.—Jet-propulsion technology in action.

sets of impeller blades to the hub, dip the wax model to form a ceramic mold, melt out the wax, and, finally, pour metal into the ceramic mold. Gill's work allowed the mold to be made directly, avoiding many time-consuming and costly steps. Reference figures 120 and 121.

Sponsor: Office of Commercial Development and Technology Transfer

Industry Involvement: North American Marine Jet, Inc.; Rocketdyne Division of Rockwell International

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